GP 222

DOCKET NO.: ACOM-0001

PATENT

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re patent application of:

Louis Stilp et al.

Serial No.: 08/059,248

Group No.: 2202

Filed: May 7, 1993

Examiner: G. Issing

For: CELLULAR TELEPHONE LOCATION SYSTEM

I, Michael D. Stein, Registration No. 34,734 certify that this correspondence is being deposited with the U.S. Postal Service as First Class mail in an envelope addressed to the Commissioner of Patents and Trademarks, Washington, D.C. 20231.

On 10-25-93

Michael D. Stein Reg. No. 34,734

Duplicate of Paper #13

Commissioner of Patents & Trademarks
Washington, DC 20231

Sir:

SUPPLEMENTAL INFORMATION DISCLOSURE STATEMENT

Pursuant to 37 C.F.R. §1.56 and in accordance with 37 C.F.R. §§1.97-1.98, information relating to the above-identified application is hereby disclosed. Inclusion of information in this statement is not to be construed as an admission that this information is material as that term is defined in 37 C.F.R. §1.56(b).

( ) In accordance with §1.97(b), since this Information Disclosure Statement is being filed either within three months of the filing date of the above-identified application, within three months of the date of entry into the national stage of the above identified application as set forth in §1.491, or before the mailing date of a first Office Action on the merits of the above-identified application, no additional fee is required.

TE18239 08/01/94 08059248 23-3050 160 126 200.00CH

(XX) In accordance with §1.97(c), this Information Disclosure Statement is being filed after the period set forth in §1.97(b) above but before the mailing date of either a Final Action under §1.113 or a Notice of Allowance under §1.311, therefore:

A193

( ) Certification in Accordance with §1.97(e) is attached; or

(XX) The fee of $200.00 as set forth in §1.17(p) is attached.

( ) In accordance with §1.97(d), this Information Disclosure Statement is being filed after the mailing date of either a Final Action under §1.113 or a Notice of Allowance under §1.311 but before the payment of the Issue Fee, therefore included are: Certification in Accordance with §1.97(e); Petition Requesting Consideration of the Information Disclosure Statement; and the fee of $130.00 as set forth in §1.17(i)(1).

( ) Copies of each of the references listed on the attached Form PTO-1449 are enclosed herewith.

( ) In accordance with §1.98(d), copies of some or all of the references listed on the attached Form PTO-1449 are not enclosed herewith because they were previously cited by or submitted to the Patent and Trademark Office in prior application Serial No. for which a claim for priority under 35 U.S.C. §120 has been made in the instant application.

Please charge any deficiency or credit any overpayment to Deposit Account No. 23-3050. This form is submitted in triplicate.

The relevance of those listed references which are not in the English language is as follows:

Respectfully submitted,

Date: October 25, 1993

Michael Stein

Signature
Michael D. Stein
Registration No. 34,734

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Sheet 1 of 1

Form PTO-1449 Modified List of Patents and Publications cited by Applicant (Use several sheets if necessary) U.S. Department of Commerce Patent and Trademark Office	Docket No. ACOM-0001	Serial No. 08/059,248
	Applicant Louis A. Stilp et al.	
	Filing Date May 7, 1993	Group 2202

U. S. PATENT DOCUMENTS

Examiner Initial		Document No.	Date	Name	Class	Subclass
	AA	5,101,501	3/31/92	Gilhousen et al.	455	33
	AB	5,126,748	6/30/92	Ames et al.	342	353
	AC	5,128,623	7/7/92	Gilmore	328	1
	AD					
	AE					
	AF					
	AG					
	AH					
	AI					
	AJ					

FOREIGN PATENT DOCUMENTS

Examiner Initial		Document No.	Date	Country	Translation YES	NO
	AK	WO 93/06685	9/18/92	PCT	yes	
	AL					
	AM					
	AN					
	AO					

EXAMINER	DATE CONSIDERED

A195

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DOCKET NO.: ACOM-0001 PATENT

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re patent application of:

Louis A. Stilp et al.

Serial No.: 08/059,248 Group No.: 2614

Filed: May 7, 1993 Examiner: G. Issing

For: CELLULAR TELEPHONE LOCATION SYSTEM

I, Michael D. Stein, Registration No. 34,734 certify that this correspondence is being deposited with the U.S. Postal Service as First Class mail in an envelope addressed to the Commissioner of Patents and Trademarks, Washington, D.C. 20231,

On 3-21-94

Michael Stein

Michael D. Stein Reg. No. 34,734

ATTN: REFUND SECTION, ACCOUNTING DIVISION, OFFICE OF FINANCE
Commissioner of Patents & Trademarks
Washington, DC 20231

Sir:

REQUEST FOR REFUND

A copy of a Supplemental Information Disclosure Statement was filed on December 20, 1993, because the Patent Office lost the Supplemental Information Disclosure as originally filed on October 25, 1993. At the time of the original filing, the required fee of $200 was paid. Therefore, because the Patent Office lost the originally-filed Information Disclosure Statement and references, and requested that a copy of same be re-filed, no additional fee should have been due. However, the deposit account of the undersigned was mistakenly charged $200 on

February 16, 1994. Please therefore credit our Deposit Account No. 23-3050 in the amount of $200.

Date: 3-21-94

Michael Stein
Signature
Michael D. Stein
Registration No. 34,734

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PTO UTILITY GRANT
Paper Number 18

The United States of America

The Commissioner of Patents and Trademarks

Has received an application for a patent for a new and useful invention. The title and description of the invention are enclosed. The requirements of law have been complied with, and it has been determined that a patent on the invention shall be granted under the law.

Therefore, this

United States Patent

Grants to the person or persons having title to this patent the right to exclude others from making, using or selling the invention throughout the United States of America for the term of seventeen years from the date of this patent, subject to the payment of maintenance fees as provided by law.

Bruce Lehman

Commissioner of Patents and Trademarks

Sandra J. Morton

Attest

PTO-1584

SPI-LOM

(RIGHT INSIDE)

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DOCKET NO.: ACOM-0001 PATENT

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re patent application of:		**Stilp et al.**	
Patent No.:	**5,327,144**	Issued:	**July 5, 1994**
Serial No.:	**08/059,248**	Group No.:	**2202**
Filed:	**5/07/93**	Examiner:	**G. Issing**

#19

For: **CELLULAR TELEPHONE LOCATION SYSTEM**

APPROVED
FEB 15 1996
FOR THE COMMISSIONER OF PAT. & T.M.

I, Michael D. Stein, Registration No. 34,734 certify that this correspondence is being deposited with the U.S. Postal Service as First Class mail in an envelope addressed to the Commissioner for Patents and Trademarks, Washington, D.C. 20231.

On December 21, 1995

Michael D. Stein Reg. No. 34,734

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Commissioner of Patents & Trademarks
Washington, DC 20231

Sir:

REQUEST FOR CERTIFICATE OF CORRECTION

It is respectfully requested that a Certificate of Correction be issued for the above-identified patent. The patent has errors in it that occurred through the fault of the Patent and Trademark Office as clearly disclosed by the records and files of the office.

Enclosed herewith please find a completed Certificate of Correction form.

Since the errors are not due to applicants' mistake, no correction fee is due. Please charge any fees for copies and any additional fees to our Deposit Account No. 23-3050. This letter is enclosed in triplicate.

Date: **December 21, 1995**

Michael D. Stein
Registration No. **34,734**

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Philadelphia, PA 19103
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UNITED STATES PATENT AND TRADEMARK OFFICE

CERTIFICATE OF CORRECTION

PATENT NO. : 5,327,144

DATED : July 5, 1994

INVENTOR(S) : Louis A. Stilp et al.

It is certified that error appears in the above-indentified patent and that said Letters Patent is hereby corrected as shown below:

Inventor name: Louis A. Stilp

MAILING ADDRESS OF SENDER:
Michael D. Stein, Esquire

Woodcock Washburn Kurtz Mackiewicz & Norris
One Liberty Place - 46th Floor
Philadelphia PA 19103

PATENT NO. 5,327,144

No. of add'l copies @ 50¢ per page

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FORM PTO 1050 (Rev. 2-93)

US005208756A

United States Patent [19]

Song

[11] Patent Number: 5,208,756

[45] Date of Patent: May 4, 1993

[54] VEHICLE LOCATING AND NAVIGATING SYSTEM

[76] Inventor: Han L. Song, 6906 Hana Rd., Edison, N.J. 08817

[21] Appl. No.: 646,706

[22] Filed: Jan. 28, 1991

[51] Int. Cl.[5] G01S 3/02

[52] U.S. Cl. 364/449; 342/457; 455/54.1; 340/991

[58] Field of Search 364/449, 443, 444; 342/457, 450, 465; 340/900, 991-993; 455/33, 53, 54, 56

[56] References Cited

U.S. PATENT DOCUMENTS

3,357,020	12/1967	Slifer, Jr.	342/44
3,419,865	12/1968	Chisholm	342/457
3,518,674	6/1970	Moorehead et al.	342/457
3,568,161	3/1971	Knickel	340/992
3,646,580	2/1972	Fuller et al.	340/989
3,680,121	7/1972	Anderson et al.	342/457
3,697,941	10/1972	Christ	340/992
3,714,650	1/1973	Fuller et al.	342/42
3,848,254	11/1974	Drebinger et al.	342/457
3,886,554	5/1975	Braun et al.	342/457
4,209,787	6/1980	Freeny, Jr.	364/449
4,222,115	9/1980	Cooper et al.	455/33
4,475,010	10/1984	Huensch et al.	455/56
4,651,157	3/1987	Gray et al.	342/457
4,680,590	7/1987	Lowe et al.	342/457
4,728,959	3/1988	Maloney et al.	342/457
4,742,357	5/1988	Rackley	342/457
4,818,998	4/1989	Apsell et al.	342/457
4,891,650	1/1990	Sheffer	342/457
4,908,629	3/1990	Apsell et al.	342/457
5,003,317	3/1991	Gray et al.	342/465
5,055,851	10/1991	Sheffer	342/457

FOREIGN PATENT DOCUMENTS

2460813	3/1981	France .
63-145976	6/1988	Japan .

OTHER PUBLICATIONS

Trackmobile, Inc., updated Business Plan (as of Oct. 1, 1990) D. Sweeney, Stolen Vehicle Recovery, Cellular Business (Sep. 1990).

Sang-Bin Rhee, Vehicle Location In Angular Sectors Based On Signal Strength, IEEE Transactions On Vehicular Technology, vol. VT-27, No. 4—Nov. 1978, pp. 244-258.

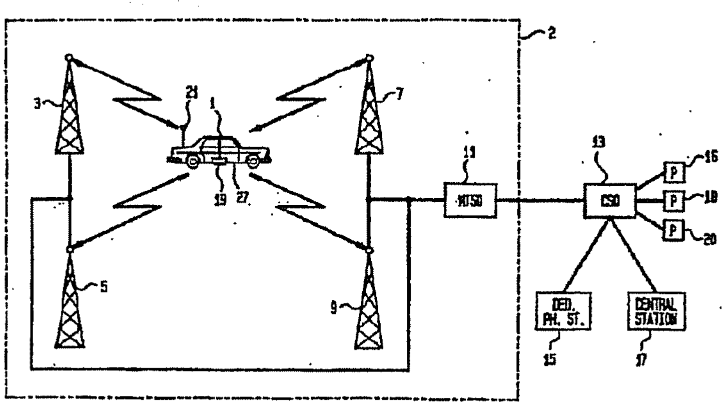
The promotional brochure titled "Hawk 3000 from Trackmobile, Inc." contains a further discussion of the vehicle locating system disclosed in U.S. Pat. No. 4,891,650.

Primary Examiner—Gary Chin
Attorney, Agent, or Firm—Lerner, David, Littenberg, Krumholz & Mentlik

[57] ABSTRACT

A vehicle locating and navigating system operating in conjunction with a cellular telephone network is provided. A small, hidden device located in a vehicle is activated through DTMF signals transmitted from any telephone station. Upon activation, the device determines the power at which normally transmitted control channels are received from several base stations of the network. Based upon these determinations, the device then calculates the distance between the vehicle and each of the base stations and, using triangulation or arculation, determines the location of the vehicle. The locational information is transmitted through a voice synthesizer back to the telephone station from which the activation signal is received, or to a different telephone station dedicated to receive this information. The locational information also is transmitted digitally to a central station where the position of the vehicle is displayed on a computer screen along with a graphical representation of a map of the region served by the cellular telephone network. An operator at the central station can assist the vehicle's operator with navigational information or provide tracking coordinates to a tracking vehicle equipped with a similar device.

40 Claims, 3 Drawing Sheets



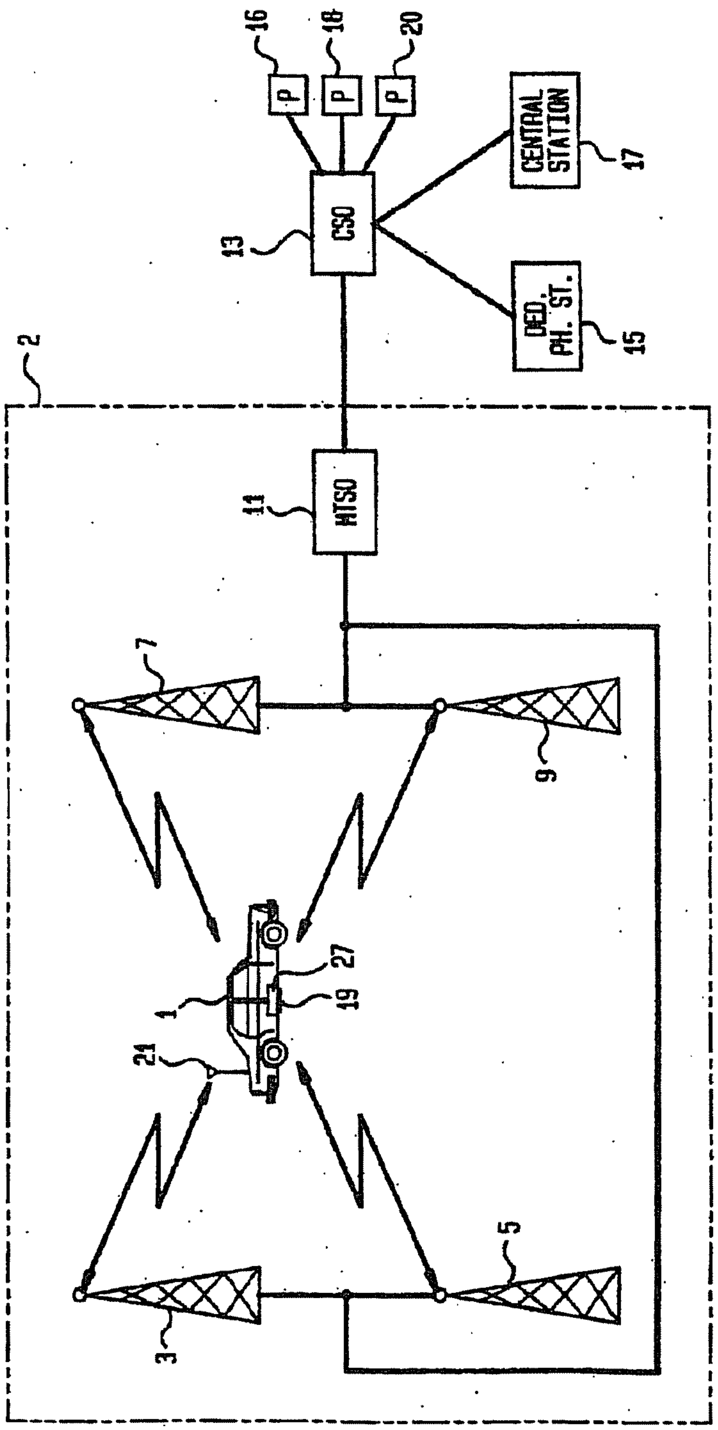

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FIG. 1

FIG. 3

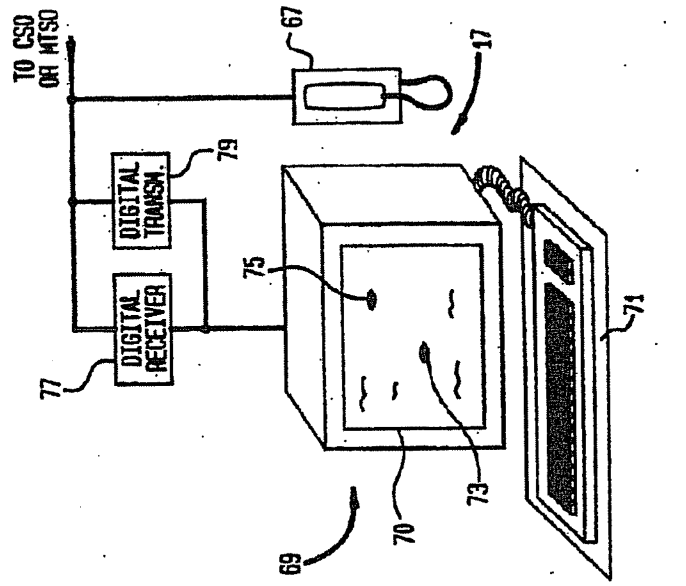
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FIG. 2

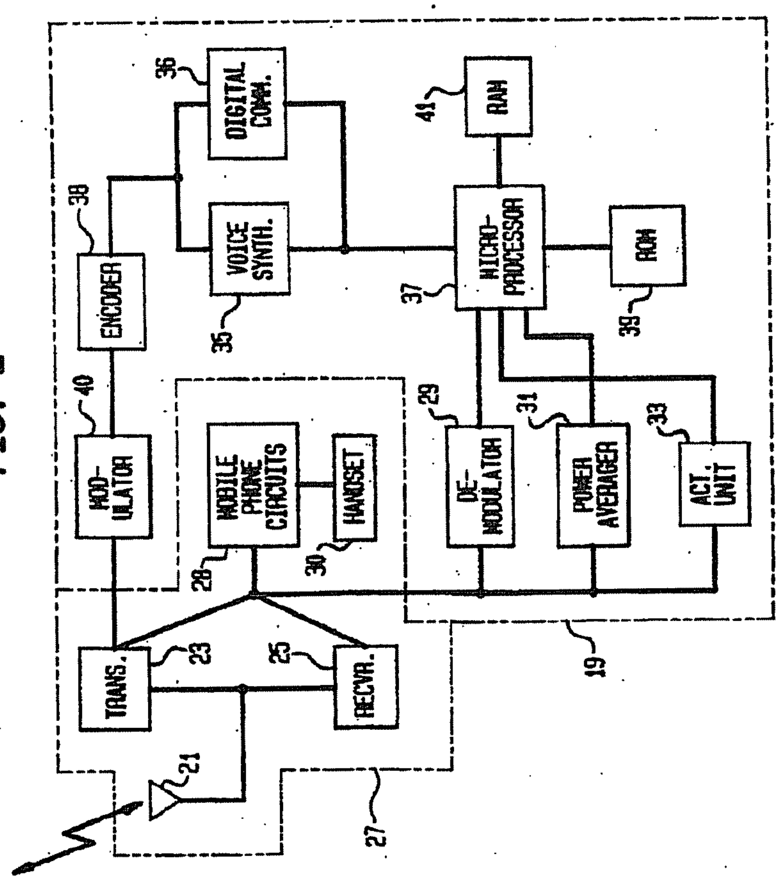
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FIG. 5

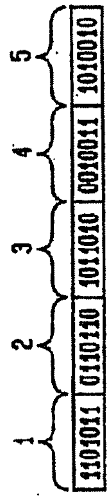


FIG. 6

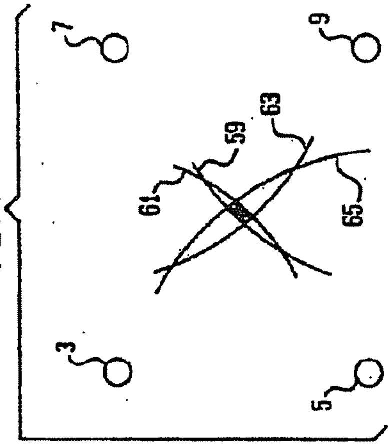
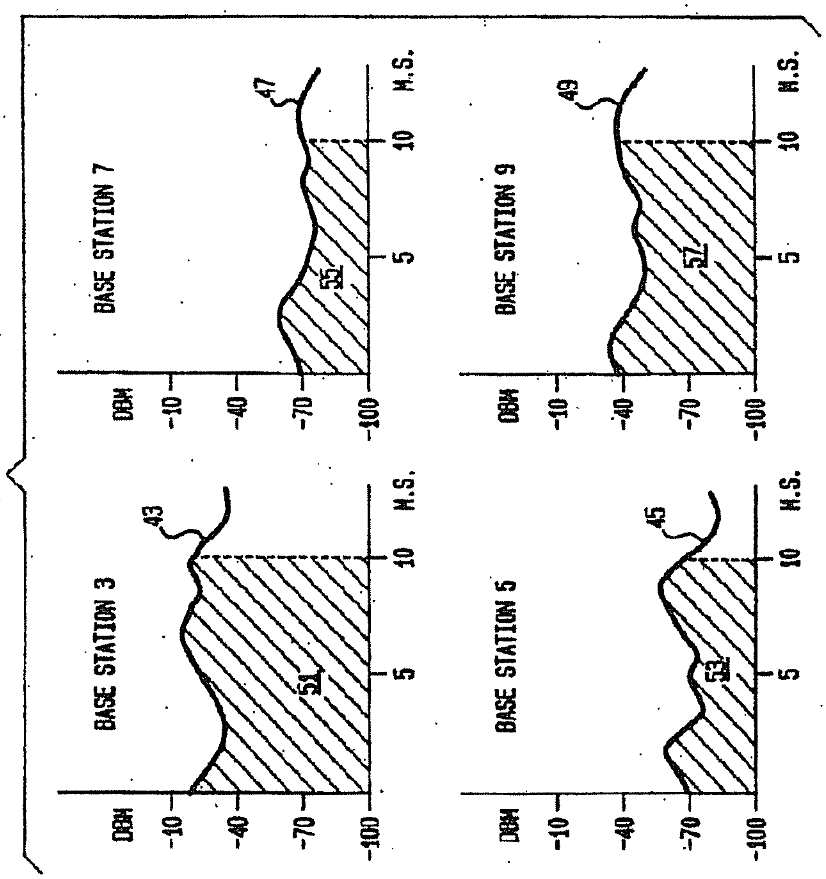


FIG. 4



VEHICLE LOCATING AND NAVIGATING SYSTEM

BACKGROUND OF THE INVENTION

This invention pertains to methods and apparatus for locating and tracking vehicles and, more particularly, to methods and apparatus for locating and tracking vehicles using a cellular telephone network.

Vehicle locating and navigating systems fall into three categories. The first category, known as dead-reckoning systems, encompasses systems which employ an electronic monitor mounted on the vehicle which constantly tracks the movement of the vehicle's wheels to determine direction and distance. This information is transmitted to a control station which relates the information to the vehicle's initial position, as indicated in the memory of a computer at the control station.

The second category encompasses systems which employ homing techniques. Examples of such systems are disclosed in U.S. Pat. Nos. 4,818,998 and 4,908,629 to Apsell et al. In these systems, a transmitter is mounted on the vehicle which emits a constant signal upon activation. A tracking vehicle, such as a police cruiser, "homes in" on the signal source using a directional antenna to determine the direction of the signal's greatest strength.

The third category encompasses systems which use triangulation or trilateralization (also known as "arculation") to determine the vehicle's location. These systems employ several land or airborne base stations (such as satellites) whose position is known and which transmit signals to, or receive signals from, the vehicle. A parameter of the signal is used to determine either the distance between each of the base stations and the vehicle, or the direction from each of the base stations to the vehicle. These data then are used for triangulation or trilateralization to determine the vehicle's position.

U.S. Pat. No. 4,891,650 to Sheffer discloses a vehicle locating and tracking system which uses the base stations of a cellular telephone network. The system comprises a mobile transmitter located on the vehicle which transmits an alarm signal upon activation to detectors located at the base stations of the network. These detectors receive the transmitted signal and transmit, to a central station, a corresponding signal indicating the strength of the received signal and the identity of the base stations receiving the signal. A computer at the central station uses these data to determine the distance between the vehicle and each of the base stations and, through trilateralization, to determine the vehicle's position.

U.S. Pat. No. 3,680,121 to Anderson, et al. also discloses a vehicle locating and tracking system using the base stations of a cellular telephone network. A transmitter located on the vehicle transmits a signal which is modulated onto a carrier for transmission to the base stations. Detectors located at the base stations determine the phase of the modulating signal with respect to a synchronization signal transmitted from a local television station. The differences in phase of the received modulating signal from at least three base stations are used to calculate the distances between the vehicle and these base stations. These data then are used to determine the vehicle's position.

An article by D. Sweeney, *Stolen Vehicle Recovery* (Cellular Business, September 1990) discloses a vehicle locating system of Code-Alarm Company which employs a device located on the vehicle for receiving signals from the base stations of the LORAN navigational network. This network transmits pulsed signals over large sections of the globe, primarily for use by ships in navigation. By measuring the differences in the times of arrival of these pulses from several base stations, the position of the vehicle is determined. The device then transmits the position-location information to a central station over a cellular telephone network.

In practice, all of these systems have presented problems. Dead-reckoning systems are expensive, accumulate errors over time and require frequent recalibration.

Homing systems require the active participation of the police or private security personnel for the operation of a tracking vehicle. These systems, moreover, generally are effective only over line-of-sight distances.

Although systems employing methods of triangulation or trilateralization can be more accurate and do not require the intervention of a tracking vehicle, these systems are prohibitively expensive if a dedicated system of base stations is required.

Although the systems disclosed in U.S. Pat. Nos. 4,891,650 and 3,680,121 employ an existing network of cellular telephone base stations, these systems nevertheless require substantial additional equipment. Dedicated circuitry must be installed at each base station to receive and interpret signals from the vehicle's transmitter and to transmit corresponding signals in response to these signals. Also, particularly in the case of stolen vehicle recovery, it is difficult to obtain sufficient power from a small, hidden transmitter for interaction with a sufficient number of cellular base stations to accurately determine location. For example, a typical transmitter of a cellular telephone normally has the capacity for communication with only the nearest base station within the network. These systems, moreover, present problems of accuracy because of multipath interference of the signal transmitted from the vehicle.

The system of Code-Alarm Company, disclosed in the article by D. Sweeney, *Stolen Vehicle Recovery*, also employs an existing network of base stations, the LORAN navigational network. The Code-Alarm system attempts to avoid the problems of transmitting a signal from the vehicle, for the determination of distance, by using signals transmitted from the base stations for this determination. The parameter of the signals used is the differences in the times of arrival of these signals at the local receiver in the vehicle. The LORAN network, however, is not well suited for precise location of a vehicle in, e.g., a large city. This network is designed for long-range navigation and, without a prohibitively large receiving antenna on the vehicle, provides a relatively coarse resolution.

SUMMARY OF THE INVENTION

The present invention provides an inexpensive, accurate system for determining a vehicle's location using the existing base stations and signals of a cellular telephone network.

In a typical cellular telephone network, a geographic area is divided into a number of small neighboring cells, each containing a base station, i.e., a small radio tower with a service radius of 1-30 miles. Each base station is assigned a number of two-way voice channels, channels used to transmit voice signals to and from the mobile unit, and a number of set-up or control channels, channels used for the transmission of digital control informa-

tion to and from the mobile unit for establishing a voice-communication link. The control channels assigned to each base station generally include several fields of data, including fields identifying the base station transmitting the signal and, in some cases, the power of the signal's transmission. The FCC requires that this power be less than 500 watts (57 dbm), but the actual power of these signals generally is less than 100 watts (50 dbm). The power of transmission of the control channels for each base station generally is higher than the power of transmission of the voice channels.

The power of the signals transmitted on the control and voice channels from each base station decreases in a fixed amount (attenuation factor) in direct relationship to the distance from the base station. This relationship corresponds to the following formula:

$$P_r = kP_t/d^n$$

wherein P_r equals the power of the signal received from the base station, k is a constant, P_t equals the transmitting power of the signal transmitted from the base station, d equals the distance between the base station and the point where the signal is received, and n is the attenuation factor. The attenuation factor generally ranges between 2 and 6, and depends principally upon the geographical terrain (e.g., farmland, mountains, cities, suburban regions, etc.) in which the base station is located.

The present invention takes advantage of these phenomena and principles governing a typical cellular telephone network. A small device, located in the vehicle, receives signals transmitted from several of the base stations in the network. These signals preferably are the signals transmitted on the control or set-up channels from these base stations. The device includes means for determining the power at which each of these signals is received. These means preferably include means for sampling the received-power of each signal over a fixed period of time and for calculating the average received-power of these samples for each signal.

The device also includes means for determining the location of each base station from which each signal is transmitted, the transmitting power at which each signal is transmitted, and the signal-attenuation factor of each signal. These means preferably read the base-station's identification and transmitting power directly from the signal. The signal-attenuation factor for each signal also can be transmitted with, and read directly from, this signal. In the alternative, the signal-attenuation factor for each base station, and the location of the base station identified from the signal, are stored in a read only memory (ROM) included in the device. The transmitting power of the signal from each base station also can be stored in the ROM, rather than read directly from the signal.

Since the attenuation factor for the signal transmitted from each base station varies from base station to base station, this factor generally must be empirically calculated before the device is constructed. Also, this factor is subject to change with time by, e.g., additional development within the area surrounding the base station. Base stations, moreover, may be added or deleted from the network over time, and their transmitting power, and other features of the signal transmitted on the control or set-up channels, may change with time. Preferably, therefore, the ROM is replaceable and can be updated with a new ROM having these new data.

The device in the vehicle further includes means for calculating the distance between the vehicle and each of the base stations as a function of the transmitting power, received-power, and signal-attenuation factor of the signal transmitted by the base station. These means preferably are a microprocessor and use the formula given above, with the value of n and P_t for each base station either stored in the ROM or read from the transmitted signal.

The device further includes means for calculating the location of the vehicle as a function of these distances and the location of each of the base stations. These means preferably use trilateralization or arculation to accomplish this task. The location of each base station preferably is stored in the ROM but also can be read from the signal transmitted from the base station. These means preferably calculate the latitude and longitude of the vehicle's location.

The device further includes means for transmitting, over the cellular telephone network, a signal identifying the vehicle's location. This signal preferably is transmitted upon activation of the device in response to an activation-signal, also transmitted over the cellular telephone network. The operator of the vehicle need not be aware of the device's activation. The activation signal preferably comprises a dual tone multifrequency (DTMF) signal transmitted from any telephone station. In response, the device preferably calculates the vehicle's location and transmits a voice-synthesized message providing this location, in latitude and longitude, back to the caller or to a separate, predetermined telephone station.

Preferably, a central station comprising a computer console also receives the signal identifying the vehicle's location, and this console includes means for displaying a map of the geographical area covered by the cellular telephone network. The vehicle's location on this map also is displayed. An operator at the console preferably follows the path of the monitored vehicle and either guides its operator to a desired location or assists the operator of a tracking vehicle to follow the monitored vehicle. Preferably, the central station establishes a communication link with the monitored and tracking vehicles over the cellular telephone network to enable the operators of these vehicles to use their cellular telephones to call the central station and to receive instructions from the operator of the central station.

A further aspect of the present invention provides methods for determining a vehicle's location. These methods include receiving signals transmitted from a plurality of base stations of a cellular telephone network, and determining the power at which each of these signals is received. These methods further include determining the location of each base station from which each signal is received, the transmitting power at which each signal is transmitted, and the signal-attenuation factor of each signal.

Using these data, the distance between the vehicle and each of the base stations is calculated. This calculation is a function of the transmitting power, received-power, and signal-attenuation factor of the signal received from each base station. The vehicle's location is calculated as a function of these distances and the location of each of the base stations, and a signal identifying this location is transmitted over the cellular telephone network to the vehicle's owner or the operator of a central station.

The identity of the base stations from which the signals are received, and the signals' transmitting power, can be determined from data transmitted with the signals. These signals preferably are the signals transmitted on the set-up or control channels of the base stations. Data providing the attenuation factors for these signals, and the locations of the base stations providing these signals, also can be transmitted with the signals. In the alternative, these data are stored in a replaceable ROM in a device on the vehicle.

The distances between the vehicle and each of the base stations preferably are calculated using the formula given above. Preferably, the value of n, the attenuation factor, is calculated empirically for each base station within the cellular telephone network, and this value, and data providing the location of each base station, are stored in the ROM.

Preferably, the step of calculating the vehicle's location includes calculating the latitude and longitude of the location using trilateralization or arculation, and the step of transmitting a signal identifying the vehicle's location includes transmitting a voice-synthesized message over the cellular telephone network containing this information. This transmission preferably is in response to an activation signal transmitted over the cellular telephone network from a telephone station, and the responding transmission is to a predetermined telephone station.

Finally, the method preferably includes also receiving the signal identifying the vehicle's location at a computer console, and displaying a map of the geographical area served by the cellular network, and the vehicle's location on the map, to an operator of the console.

Other objects, features and advantages of the present invention will be more readily apparent from the detailed description of the preferred embodiments set forth below, taken in conjunction with the accompanying drawings.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. 1 is a functional block diagram of a vehicle locating and navigating system in accordance with the present invention.

FIG. 2 is a functional block diagram of the vehicle locating transceiver for the system of FIG. 1.

FIG. 3 is a functional block diagram of the central control station for the system of FIG. 1.

FIG. 4 are diagrams of signal-power versus time for typical signals received by the vehicle locating transceiver of FIG. 2.

FIG. 5 is a diagram illustrating several fields of the digital data for typical signals received by the vehicle locating transceiver of FIG. 2.

FIG. 6 is a graphical illustration of the method of trilateralization used by the present invention.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENTS

A functional block diagram of a vehicle locating and navigating system in accordance with the present invention is illustrated in FIG. 1. The system includes a small, preferably hidden, vehicle locating transceiver 19 affixed to vehicle 1 which operates within a geographical area served by a cellular telephone network 2. Vehicle 1 also includes a standard cellular telephone 27, including antenna 21, for receiving signals from, and transmitting signals to, the base stations of the cellular network.

Cellular network 2 includes the conventional components of such a network, including a plurality of fixed base stations such as base stations 3, 5, 7 and 9, and one or more mobile telephone switching offices (MTSO's) 11 which communicate with the base stations over land lines or radio-communication links. Each MTSO 11 is connected to the public telephone network through land lines connecting the MTSO to one or more central switching offices (CSO's) 13. These connections enable communication with mobile telephones served by the cellular network through virtually any telephone station in the world, such as telephone stations 16, 18 and 20, dedicated phone station 15 or phone station 67 within control station 17 (FIG. 3).

In a manner which is conventional for cellular telephone networks, each base station within the network is assigned a number of two-way voice channels, i.e., channels used to transmit voice signals to and from mobile units operating within the network, and a number of set-up or control channels, i.e., channels used for the transmission of digital control information to and from the mobile units. The function of the set-up or control channels includes, inter alia, establishing a voice-communication link with a mobile unit prior to the initiation of a telephone conversation. Generally, each of the channels assigned to each of the base stations operates at a different frequency in order to avoid interference. Because of the limited number of frequencies available within each network, however, base stations remote from each other may be assigned one or more of the same frequency channels. In the United States, these channels generally operate at frequencies between approximately 825 and 890 megahertz (MHz), and channels operating from the same base station are separated by approximately 45 MHz.

Generally, voice information transmitted over the voice channels is effected using frequency modulated (FM) analog signals, and set-up and control information transmitted over the control channels is effected using FM digital signals. Other methods of modulating voice and digital data onto the carrier signals, such as amplitude modulation (AM), quadraduture phase shift keying (QPSK) and binary phase shift keying (BPSK), are feasible, however, and likely will be used by cellular telephone networks in the future.

In the United States, the Federal Communications Commission (FCC) limits the maximum power of a carrier signal transmitted from the base station of a cellular telephone network to 500 watts (57 dbm). Generally, however, the actual power of transmission is considerably less, e.g., less than 100 watts (50 dbm), in order to avoid interference between base stations. In most cellular networks, the power of transmission of the control channels for each base station is higher than the power of transmission of the voice channels.

FIG. 5 is a diagram illustrating typical frequency-modulated digital data transmitted on a control channel of a base station of a cellular telephone network. These data are segregated into a plurality of fields, only five of which are shown in the illustration. Each field contains various set-up and/or control information to, inter alia, establish a communication link between a mobile phone operating within the network and the base station transmitting the control signal. These fields generally include fields identifying the base station transmitting the signal and, in some cases, fields providing various descriptive information with respect to the base station, such as the power at which the signal is transmitted.

Generally, a mobile phone seeking to establish a telephonic link through the network establishes communication with the base station from which the strongest control signal is received. Upon making this determination, an automatic protocol is followed to establish the voice communication link. If the power of this link becomes inadequate for proper communication, such as, e.g., the mobile phone traveling outside of the normal transmitting range of the base station with which the mobile phone is in communication, a handoff protocol is followed for transferring the link from one voice channel to another, generally to a channel transmitted from a different and nearer base station.

The power of the signals received from the control and voice channels from each base station within the network decreases in a fixed amount (attenuation factor) in direct relationship to the distance from the base station. This relationship corresponds to the following formula:

$$P_r = kP_t/d^n,$$

wherein P_r equals the power at which the signal is received from the base station, k is a constant, P_t equals the power at which the signal is transmitted from the base station, d equals the distance between the base station and the point where the signal is received, and n is the attenuation factor. The attenuation factor generally ranges between 2 and 6, and depends principally upon the geographical terrain, e.g., farmland, mountains, cities, suburban regions, etc., in which the base station is located.

FIG. 2 is a block diagram of the principal components of vehicle locating transceiver 19 and mobile telephone 27. Vehicle locating transceiver 19 preferably is a modular, add-on component to a standard, mobile telephone and, therefore, takes advantage of components already present in such a phone. Of course, vehicle locating transceiver 19 also could be designed to operate independently of a mobile telephone and, in that case, all components of the mobile telephone used by the transceiver, as shown in FIG. 2, could be included in the transceiver.

Signals transmitted from a set of base stations, such as base stations 3, 5, 7 and 9, are detected by antenna 21 and receiver 25. Receiver 25 is a component of mobile telephone 27 and transmits the received signals in the normal manner to the circuits 28 of the mobile phone. When these signals include a paging signal for mobile phone 27, these circuits further process these signals, set up a communication link between the mobile telephone and the base station from which the strongest signal is received, activate a signaling tone to notify the mobile phone's user of the incoming call and complete the voice communication over voice channels between the mobile telephone and base station. The user uses handset 30 connected to mobile phone circuits 28 in the conventional manner for the receipt and transmission of audible tones.

Antenna 21 and receiver 25 also function to receive an activation signal for vehicle locating transceiver 19. This signal can be in the same format as a paging signal for mobile telephone 27, i.e., a dual tone multiple frequency (DTMF) signal transmitting the ten digit number uniquely identifying mobile telephone 27. The activation signal can be a second, unique DTMF signal uniquely identifying vehicle locating transceiver 19. If transceiver 19 is an add-on module to a mobile telephone, this number can incorporate the digits assigned to that telephone with the addition of several digits or symbols at the beginning and/or end of that number.

The activation signal for vehicle locating transceiver 19 is transmitted to the transceiver over cellular telephone network 2 from any telephone station such as, e.g., telephone stations 16, 18 or 20, dedicated phone station 15, or a telephone station 67 (FIG. 3) associated with control station 17. If the operator of vehicle 1 desires navigational assistance from control station 17, he or she can activate transceiver 19 by transmitting the activation signal from mobile telephone 27. In the alternative, an activating switch (not shown) can be installed directly on the mobile phone or transceiver, preferably in a hidden location.

Activation unit 33 continuously scans the transmissions received by receiver 25 for the activation signal. If this signal is received, activation unit 33 transmits a signal to microprocessor 37 which transmits corresponding activation signals to the other components of the system.

Upon activation, demodulator 29 demodulates each control signal received through antenna 21 and receiver 25. Since these signals are transmitted from base stations of varying distances from vehicle 1, they have varying strengths. If the strength of a signal is sufficient for accurate demodulation of the transmitted data, demodulator 29 operates upon the signal and determines the digital data transmitted by the signal. Antenna 21, receiver 25 and demodulator 29 are capable of receiving and demodulating control signals from at least three base stations within most locations served by cellular network 2. Demodulator 29 is a standard device for the method of modulation used by the network, generally FM modulation. As stated above, the method of modulation also may be AM, QPSK, BPSK or some other mode of modulation.

Demodulator 29 transmits the various fields of demodulated digital data from each of the detected control signals to microprocessor 37. Microprocessor 37 reads these data and, from the fields providing the identities of the base stations transmitting the signals, determines these identities. This determination is made by comparing these data with the digital identities of each of the base stations within cellular network 2 stored in ROM 39. Preferably, ROM 39 also permanently stores digital records of the identities of the base stations in other, adjoining cellular telephone networks in which vehicle 1 is likely to operate. In the alternative, demodulator 29 can determine and transmit the transmission—frequencies of each of the detected control or voice channels, and microprocessor 37 can determine the identities of the base stations from these frequencies.

If the control signals transmitted from the base stations of cellular network 2 also include a field of data providing the power at which each signal is transmitted from the base station (e.g. 75 dbm, 50 dbm, 35 dbm, etc.), microprocessor 37 reads these data as provided from demodulator 29. If the cellular network is not configured to provide this information with the control signals, these data are permanently stored in ROM 39 in association with the identification of each base station. In the latter case, microprocessor 37 reads both the identity of the base station and the power of its transmission from the data stored in ROM 39.

ROM 39 also stores, in association with the data identifying each base station, data providing the location of the base station, in, e.g., latitude and longitude, and the

attenuation factor of the base station. Since the attenuation factor is unique for each base station and depends principally upon many factors concerning the geographical region in which the base station is located, this factor preferably is empirically determined for each base station before ROM 39 is programmed.

Obviously, over time, the data programmed into ROM 39 will become obsolete. This obsolescence of the data most likely will be caused by modifications (e.g., new construction) within the geographical area of a base station, the construction of new base stations, refinements in the empirical calculations of the attenuation factors, changes in the power at which control signals are transmitted, and/or modifications in the digital fields of the control signals. ROM 39, therefore, is a plug-in device which easily can be replaced with a new ROM containing the updated data without the necessity for replacing the remaining components of vehicle locating transceiver 19.

Power averager 31 determines the average power at which each control signal, demodulated by demodulator 29, is received by antenna 21 and receiver 25. The instantaneous power at which these signals are received corresponds to the formula: $P_r=kP_t/d^n$, as discussed above. As a result of fading and similar phenomena of radio transmissions, the actual received power varies to some extent with time from the power predicted by this formula.

The averaging function performed by power averager 31 is illustrated graphically in FIG. 4. This figure depicts graphs for the instantaneous power of control signals 43, 45, 47 and 49 which are received by vehicle locating transceiver 19 from base stations 3, 5, 7 and 9, respectively. The y-axis of each graph represents the power in dbm at which each signal is received by the transceiver, and the x-axis of each graph represents the time-period of receipt. Power averager 31 calculates the average power of each signal over a fixed period of time, e.g., 10 milliseconds. This average power for signals 43, 45, 47 and 49 is represented by the areas 51, 53, 55 and 57, respectively, shown in these graphs, divided by the period (10 m.s.) over which the average is taken. These average-power calculations are performed and transmitted to microprocessor 37 continuously while vehicle locating transceiver 19 is activated. The microprocessor stores these data in RAM 41.

Microprocessor 37 uses the data from power averager 31 to calculate the distance d between the transceiver and each base station using the formula discussed above. The values for k and n are retrieved from ROM 39, the average values for P_r are retrieved from RAM 41, and the values for P_t are either retrieved from ROM 39 or read directly from the control signals (if, as discussed above, this information is present in the control signals). The calculated values for d for each base station are stored in RAM 41.

Microprocessor 37 then calculates the approximate position of transceiver 19 (and vehicle 1) with respect to the base stations from which the signals are received using the process of arculation or trilateralization illustrated in FIG. 6. The position (latitude and longitude) of each base station is retrieved from ROM 39, and the distance from each base station to the transceiver/vehicle is retrieved from RAM 41. These distances are illustrated in FIG. 6 by arcs 61, 65, 63 and 59 for base stations 3, 5, 7 and 9, respectively. The approximate location of the vehicle is identified by the area "x" enclosed by the intersection of these four arcs. As is evident from this description, the accuracy of this locational determination increases with the number of base stations from which control signals are received and identified, and with respect to which a distance calculation can be performed. Generally, a distance-determination to at least three base stations is required for the vehicle's location to be ascertained. When distances to more than three base stations are available, microprocessor 37 can calculate the vehicle's location using different combinations of the distances to three of the base stations and determine the vehicle's location on the basis of the average of these calculations.

Microprocessor 37 stores the vehicle's location (latitude and longitude) in RAM 41, and continuously updates these data as new information is received from power averager 31 and demodulator 29. The locational data also are transmitted to voice synthesizer 35 and digital communicator 36. Voice synthesizer 35 converts the digital data from microprocessor 37 to an analog signal representing a synthesized voice stating the locational information. Encoder 38 encodes this analog signal for the telephone station to which it should be transmitted. This telephone station can be the same telephone station from which the activation signal was received, any other telephone station connected to CSO 13, or dedicated phone station 15. Transmission of the locational information to a dedicated phone station prevents this information from being received by an unauthorized person activating the device. The encoded, analog voice signal is FM modulated by modulator 40 and transmitted over the cellular telephone network to the designated phone station by transmitter 23 through antenna 21. Transmitter 23 and antenna 21 are the same apparatus used for transmissions from mobile telephone 27. Of course, depending upon the compatibility of cellular network 2, modulator 40 can use other forms of modulation.

Microprocessor 37 also transmits the digital locational data to digital communicator 36 which processes these data for transmission in digital format over the cellular network. Encoder 38 also encodes these digital data for transmission to a designated telephone station associated with CSO 13. In this case, the telephone station is digital receiver 77 associated with central station 17, shown in FIG. 3. The encoded, digital data are transmitted to modulator 40 which FM modulates these data for transmission over the cellular network. This transmission also is effected through transmitter 23 and antenna 21.

Control station 17 is connected to the cellular network through CSO 13 and MTSO 11. Of course, control station 17 also could be connected to the cellular network directly through MTSO 11. Digital receiver 77 receives the digital, locational information and transmits a corresponding digital signal to computer 69. Computer 69 processes this information, in a conventional manner, and projects a representational symbol 73 of the location of vehicle 1 on display screen 70 with respect to a graphical representation of a map, also displayed on the screen, of the region served by cellular network 2. The position 75 of a second vehicle, which can be a tracking vehicle guided by an operator of control station 17, also can be displayed on computer screen 70. This second vehicle can be equipped with a vehicle locating transceiver, similar to transceiver 19, which transmits locational information to control station 17 in the same manner as the transceiver on vehicle 1. The various functions and operations of computer 69 are

controlled by the operator in a conventional manner using keyboard 71.

Control station 17 also is equipped with digital transmitter 79 and telephone station 67. Digital transmitter 79 is controlled by the operator through computer 69 and keyboard 71. This transmitter can transmit digital signals back to transceiver 19 to, e.g., activate the transceiver. In this case, activation unit 33 is responsive to an activation signal transmitted either in digital or DTMF format.

Control station 17 also is equipped with conventional telephone station 67, which can function as the dedicated telephone station 15. An operator of vehicle 1 seeking, e.g., assistance in navigation can communicate with the operator of control station 17 from mobile telephone 27 to telephone station 67. By activating vehicle locating transceiver 19, the operator of the vehicle can cause his or her position to appear on display screen 70 of computer 69 to enable the operator of control station 17 to provide such assistance. Telephone station 67 also can be used by the operator of control station 17 to provide instructions to an operator of the tracking vehicle over a mobile telephone located in that vehicle.

Although particular embodiments of the present invention have been shown and described, many varied embodiments incorporating the teachings of the present invention easily may be constructed by those skilled in the art. For example, the identity of the base stations from which signals are received can be determined by the frequency of the voice or control channels and, if one or more channels of the base stations within the cellular network transmit at the same frequency, the identities of the base stations can be determined from the particular combination of channel-frequencies received at any given time. The monitored signals from which the strength/distance determinations are made can be signals other than the control channels, such as the voice channels or any other channels or signals normally transmitted from the base stations for cellular-telephone communications. Also, rather than store in the ROM data providing the location of each base station, the value of k and the value of n, additional fields of data can be included in the control signals to provide this information. In that case, a new ROM would not be required when this information is updated.

What is claimed is:

1. A system for determining a vehicle's location comprising:

(a) receiving means for receiving signals transmitted from a plurality of base stations of a cellular telephone network;

(b) first determining means for determining the received-power at which each of said signals is received;

(c) second determining means for determining the location of each of said base stations from which each of said signals is transmitted, the transmitting power at which each signal is transmitted, and the signal-attenuation factor of each signal;

(d) first calculating means for calculating the distance between said vehicle and each of said base stations as a function of the transmitting power, received-power, and signal-attenuation factor of each of said signals;

(e) second calculating means for calculating the vehicle-location of said vehicle as a function of said distances and the location of each of said base stations; and

(f) transmitting means for transmitting a signal identifying said vehicle-location.

2. A system as in claim 1, wherein said signals comprise control-channel signals transmitted from said base stations.

3. A system as in claim 1, wherein said first determining means comprise means for averaging the received-powers at which each of said signals is received over a fixed period of time.

4. A system as in claim 1, further comprising storing means for storing for each of said base stations data identifying said base station, said base station's location, and the signal-attenuation factor of the signal transmitted by said base station.

5. A system as in claim 4, wherein said storing means further comprise means for storing for each of said base stations data identifying the transmitting power of the signal transmitted by the base station.

6. A system as in claim 1, wherein each of said signals includes information identifying the base station from which the signal is transmitted.

7. A system as in claim 6, wherein said information is the frequency of the signal's transmission.

8. A system as in claim 6, wherein said information is digital data transmitted by the signal.

9. A system as in claim 6, wherein each of said signals further includes data identifying the transmitting power at which the signal is transmitted.

10. A system as in claim 9, wherein each of said signals further includes data identifying the signal-attenuation factor of the signal.

11. A system as in claim 4, wherein said storing means comprise a replaceable ROM.

12. A system as in claim 1, wherein said first calculating means calculates each of said distances on the basis of the formula:

$$P_r = kP_t/d^n,$$

wherein P_r equals the received-power of the signal transmitted from the base station, k is a constant, P_t equals the transmitting power of the signal transmitted from the base station, n equals the signal-attenuation factor of the signal transmitted from the base station, and d equals the distance between the base station and the vehicle.

13. A system as in claim 12, wherein n ranges between 2 and 6.

14. A system as in claim 1, wherein said second calculating means calculates the latitude and longitude of the vehicle-location of said vehicle using arculation, and said transmitting means transmits a voice-synthesized message containing said latitude and longitude.

15. A system as in claim 1, wherein said second calculating means calculates the latitude and longitude of the vehicle-location of said vehicle using arculation, and said transmitting means transmits a digital signal containing said latitude and longitude.

16. A system as in claim 1, further comprising means for activating said system in response to an activation-signal transmitted over said cellular telephone network.

17. A system as in claim 16, wherein said activation signal comprises a DTMF signal transmitted from a telephone station.

18. A system as in claim 1, further comprising a computer console for receiving the signal identifying said vehicle-location, and wherein said console comprises means for displaying a map of the geographical area

covered by said cellular telephone network and the vehicle-location of said vehicle on said map.

19. A system as in claim 1, further comprising means for transmitting the signal identifying said vehicle-location over said cellular telephone network.

20. A system as in claim 19, further comprising means for transmitting the signal identifying said vehicle-location to a predetermined telephone station.

21. A method for determining a vehicle's location comprising:

(a) receiving signals transmitted from a plurality of base stations of a cellular telephone network;

(b) determining the received-power at which each of said signals is received;

(c) determining the location of each of said base stations from which each of said signals is transmitted, the transmitting power at which each of said signals is transmitted, and the signal-attenuation factor of each of said signals;

(d) calculating the distance between said vehicle and each of said base stations as a function of the transmitting power, received-power, and signal-attenuation factor of each of said signals;

(e) calculating the vehicle-location of said vehicle as a function of said distances and the location of each of said base stations; and

(f) transmitting a signal identifying said vehicle-location.

22. A method as in claim 21, wherein said signals comprise control-channel signals transmitted from said base stations.

23. A method as in claim 21, further comprising the step of averaging the received-powers at which each of said signals is received over a fixed period of time.

24. A method as in claim 21, further comprising the step of storing for each of said base stations data identifying said base station, said base station's location, and the signal-attenuation factor of the signal transmitted by said base station.

25. A method as in claim 24, further comprising the step of storing for each of said base stations data identifying the transmitting power of the signal transmitted by the base station.

26. A method as in claim 21, wherein each of said signals includes information identifying the base station from which said signal is transmitted.

27. A method as in claim 26, wherein said information is the frequency of the signal's transmission.

28. A method as in claim 26, wherein said information is digital data transmitted by the signal.

29. A method as in claim 26, wherein each of said signals further includes data identifying the transmitting power at which said signal is transmitted.

30. A method as in claim 29, wherein each of said signals further includes data identifying the signal-attenuation factor of said signal.

31. A method as in claim 24, wherein said step of storing comprises storing said data in a replaceable ROM.

32. A method as in claim 21, wherein said step of calculating the distance between said vehicle and each of said base stations is based on the formula:

$$P_r = kP_t/d^n,$$

wherein P_r equals the received-power of the signal transmitted from the base station, k is a constant, P_t equals the transmitting power of the signal transmitted from the base station, n equals the signal-attenuation factor of the signal transmitted from the base station, and d equals the distance between the base station and the vehicle.

33. A method as in claim 32, wherein n ranges between 2 and 6.

34. A method as in claim 21, wherein said step of calculating the vehicle-location of said vehicle includes calculating the latitude and longitude of the location of said vehicle using arculation, and said step of transmitting a signal identifying said vehicle-location includes transmitting a voice-synthesized message containing said latitude and longitude.

35. A method as in claim 21, wherein said step of calculating the vehicle-location of said vehicle includes calculating the latitude and longitude of the location of said vehicle using arculation, and said step of transmitting a signal identifying said vehicle-location includes transmitting a digital signal containing said latitude and longitude.

36. A method as in claim 21, further comprising the step of initiating said method in response to an activation-signal transmitted over said cellular telephone network.

37. A method as in claim 36, wherein said activation signal comprises a DTMF signal transmitted from a telephone station.

38. A method as in claim 21, further comprising the step of receiving the signal identifying said vehicle-location at a computer console, and displaying a map of the network and the vehicle-location of said vehicle on said map.

39. A method as in claim 21, further comprising the step of transmitting the signal identifying said vehicle-location over said cellular telephone network.

40. A method as in claim 39, further comprising the step of transmitting the signal identifying said vehicle-location to a predetermined telephone station.

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TPI0022151

**IN THE UNITED STATES DISTRICT COURT
FOR THE DISTRICT OF DELAWARE**

TRUEPOSITION, INC., PLAINTIFF/ COUNTERCLAIM- DEFENDANT, v. ANDREW CORPORATION, DEFENDANT/ COUNTERCLAIM-PLAINTIFF.	)	**CIVIL ACTION NO. 05-00747-SLR**

ANDREW CORPORATION'S SUPPLEMENTAL RESPONSES TO TRUEPOSITION'S INTERROGATORY NOS. 3 AND 7

Pursuant to Rules 26(e) and 33 of the Federal Rules of Civil Procedure, Andrew Corporation hereby supplements its responses to TruePosition's Interrogatory Nos. 3 and 7. Pursuant to Rule 26(e) of the Federal Rules of Civil Procedure, Andrew expressly reserves the right to supplement these responses further.

Interrogatory No. 3

State the factual basis for the allegation in paragraph 8 of the Counterclaims section of Andrew's Answer that "Andrew has not infringed the '144 Patent, and Andrew's supply of services and/or equipment has not infringed and will not infringe the '144 Patent."

Response:

Subject to and without waiving its General Objections, Andrew responds as follows:

TruePosition accuses Andrew of infringing only claims 1, 2, 22, 31 and 32 of the '144 Patent. *See* Plaintiff's Seventh Supplemental Responses to Defendants' First Interrogatories.

Andrew does not infringe any of those claims, nor any other claim of the '144 Patent, for at least the following reasons:

I. Andrew's Accused Products Do Not Infringe Any Claim as a Matter of Law, Because They Do Not Monitor or Use Periodic Reverse Control Channel Signals.

Each claim of the '144 Patent requires a mobile cellular telephone to be located by monitoring and using periodic, reverse control channel signals initiated and transmitted by the mobile cellular phone. *See, e.g,* claims 1, 22 and 31 (the three independent claims in the patent). The specification of the '144 Patent unequivocally describes the "prescribed set of reverse control channels" required by each claim as the reverse control channels that exist in an AMPS system. Andrew's accused products do not determine location of a mobile telephone using "reverse control channel signals" as that term must be interpreted in light of the specification and would be understood by one of ordinary skill in the art.

TruePosition asserts that the Standalone Dedicated Control Channel in a GSM system satisfies the reverse control channel limitation. But a Standalone Dedicated Control Channel is not a "reverse control channel." For example, a reverse control channel is simultaneously shared by multiple mobile phones. In contrast, by definition, a Standalone *Dedicated* Control Channel is not simultaneously shared by multiple mobile phones but instead is a *dedicated* communications channel between a *single* mobile phone and a base station.

In addition, a reverse control channel communicates only signaling information and not traffic information, as TruePosition's Chief Technical Officer Rob Anderson testified at his September 21, 2006 deposition:

Q: Do control channels communicate anything other than signaling information?

A: No.

(Anderson 09/21/06 Deposition Transcript, p. 42, ll. 5-7)

Unlike a reverse control channel, a Standalone Dedicated Control Channel carries and communicates information other than signaling information. A Standalone Dedicated Control Channel carries and communicates traffic information, such as SMS (e.g., text messaging). According to TruePosition's Chief Technical Officer Rob Anderson, performing MT-LR (i.e., location requests coming from the network) on channels that carry both traffic and signaling information does not infringe the '144 Patent:

Q: Are you aware of any channels in the GSM system that would carry both signaling and traffic information?

A: Yes; a traffic channel would carry both signaling and traffic information.

Q: Any other channels, other than the traffic channel?

A: Not that I am aware of.

Q: And you testified earlier that if the mobile phone were on the traffic channel, MT-LR would not infringe the '144 patent; is that right?

A: That's correct.

(Anderson 09/21/06 Deposition Transcript, p. 166, l. 25 - p. 167, l. 13)

Regardless of what TruePosition asserts is a reverse control channel, Andrew cannot infringe the '144 Patent because Andrew's geolocation system does not monitor *any* periodic transmissions from the mobile telephone. During prosecution of the '144 Patent, the applicants emphasized to the PTO — and the public — that the alleged invention claimed in the '144 Patent determines the location of mobile cellular telephones by monitoring periodic reverse control transmissions initiated by the mobile cellular phones. *See, e.g.*, May 7, 1993 Information Disclosure Statement Supporting Petition to Make Special. The applicants distinguished numerous prior art references by arguing the references fail to disclose or teach "an apparatus or

method for determining the location of a mobile cellular telephone *by monitoring control channel transmissions*." *Id.* (emphasis added). For example:

- The applicants distinguished the prior art "Passive Location of Mobile Cellular Telephone Terminals" article by arguing it "lacks disclosure of the concept of *monitoring* <u>control channels</u> to obtain data from which the locations of mobile cellular telephones are determined." *Id.* at 1-2 (italics added; underlining in original).

- In distinguishing prior art U.S. Patent No. 4,740,792 to Sagey, the applicants stated, "Applicants respectfully note that [this] patent fails to teach or suggest a ground-based system locating cellular telephones as described in applicants' claims. *In particular, there is no teaching or suggestion of monitoring control transmissions or of the claimed apparatus and methods to achieve such monitoring*." *Id.* at 3 (emphasis added).

- In distinguishing prior art U.S. Patent No. 4,651,157 to Gray et al., the applicants stated, "[t]his patent neither teaches nor suggests a system for *locating cellular telephones by monitoring control channels* . . ." *Id.* at 4 (emphasis added).

- In distinguishing prior art U.S. Patent No. 4,742,357 to Rackley, the applicants stated, "[t]his patent neither discloses nor suggests a system for locating cellular telephones *by monitoring control channels* . . ." *Id.* at 5 (emphasis added).

- In distinguishing each of prior art U.S. Patent No. 4,728,959 to Maloney, prior art U.S. Patent No. 4, 651,156 to Martinez, prior art U.S. Patent No. 4,596, 988 to Wanka and prior art U.S. Patent No. 5,023,809 to Spackman et al., the applicants stated, "[t]his patent lacks any disclosure or suggestion of an apparatus or method for determining the location of a mobile cellular telephone *by monitoring control channel transmissions*." *Id.* at 6, 7, 8 (emphasis added).

- In distinguishing another series of prior art patents, the applicants again differentiated the prior art by arguing it did not teach monitoring periodic reverse control channel transmissions, and the applicants emphasized their alleged invention locates a mobile cellular phone by monitoring the control channel transmissions the cellular phone already periodically transmits during operation:

> These patents lack any disclosure or suggestion of a system or method for locating mobile cellular telephones by monitoring control channel signals and processing such signals to obtain location information. As discussed in applicants' specification, there are numerous advantages provided by monitoring control channels to track the locations of cellular telephones. . . . *[C]ontrol channel transmissions already occur periodically in cellular systems*. . . .[S]ince the frequency of control channel transmissions is software controllable, a location system in accordance with the present invention could control the frequency of control channel transmissions and offer different subscribers different location information update rates.

Id. at 8-10 (emphasis added).

Thus, the applicants repeatedly represented to the PTO — and the public — that the alleged invention claimed in the '144 Patent is patentable because it locates mobile cellular phones *by monitoring* the cellular phones' periodic control channel transmissions. TruePosition cannot now disavow all those prosecution history statements and argue the '144 Patent claims cover a system that locates a cellular phone through means other than monitoring the phone's periodic control channel transmissions.

Andrew's accused products do not monitor cellular phones' periodic transmissions and do not locate mobile cellular phones through monitoring the phones' periodic transmissions. Rather, with Andrew's geolocation system, when a user wishes to locate a mobile cellular phone, the user through the cellular telephone system must provide Andrew's geolocation system with the channel assignment information for the signal to be received by Andrew's system. Andrew's system receives the signals using the assignment information provided, and determines the

location of the signal source without regard to the identity of the transmission source or the type of signals being transmitted.

Thus, in Andrew's accused products, there is no monitoring of the cellular phones' periodic transmissions and no location determinations made based on monitoring of the cellular phones' periodic transmissions. TruePosition's prosecution history statements are clear that the '144 Patent claims require the location of the mobile phone to be determined based on monitoring of the cellular phone's periodic control channel transmissions. TruePosition's prosecution history statements bar it as a matter of law from claiming Andrew's accused products infringe the '144 Patent either literally or under the doctrine of equivalents.

II. Andrew Does Not Infringe for Other, Independent Reasons.

In addition to not infringing any claim of the '144 Patent for the reasons stated above, Andrew also does not infringe for other, independent reasons. For example:

A. TruePosition's infringement theory is that Andrew contributes to or induces infringement of the '144 Patent. There can be no contributory infringement as a matter of law, because Andrew's accused products will have a substantial non-infringing use regardless of how TruePosition tries to interpret the '144 Patent claims. As explained above, when a user wishes to locate a mobile cellular phone using Andrew's accused products, the user through the cellular telephone system must provide the specific channel assignment to Andrew's geolocation system in order for the system to locate the phone. Andrew's accused products have no control over the type of signals being received or the identity of the transmission source.

TruePosition admits the '144 Patent is not infringed when Andrew locates cellular phones on the cellular system's voice/traffic channel. *See, e.g.* TPI_E0002803, TPI_E0002275. Because Andrew's accused products will locate cellular phones on the cellular system's

voice/traffic channel and have no control over the type of signal that is received and used in locating the phone, Andrew's accused products will have a substantial non-infringing use regardless of how TruePosition tries to interpret the '144 Patent claims. Thus, Andrew cannot contributorily infringe the '144 Patent as a matter of law.

Likewise, there can be no inducement of infringement because Andrew has not induced anyone to infringe the '144 Patent, nor has Andrew had any specific intent to encourage anyone to infringe the '144 Patent. Each claim of the '144 Patent requires cellular phones to be located on the cellular system's reverse control channel. As explained above, Andrew's accused products will locate cellular phones on the cellular system's voice/traffic channel and have no control over the type of signal that is received and used in locating the phone. Nor does Andrew instruct or encourage anyone to use any specific type of channel to locate cellular phones.

B. Andrew's accused products also lack many other limitations of the '144 Patent claims, including without limitation, the "means for processing said frames of data," "means for determining" and "reverse control channels" required by claims 1-21, the "locating means for automatically determining," the "database means" and "reverse control channels" required by claims 22-30, and the "processing said signals at each cell site to produce frames of data," "determining" and "reverse control channels" required by claims 31-45. Andrew notes that TruePosition still has not identified the alleged corresponding structure in the '144 Patent for any of the means-plus-function limitations in the asserted claims. Rather, TruePosition has provided only vague allegations that lack the specificity required for Andrew to respond in any detail.

* * *

Andrew reserves the right to supplement, modify and/or amend its answer to this interrogatory.

Interrogatory No. 7

State the factual basis for the allegations in the First Affirmative Defense and paragraph 9 in the Counterclaims section of Andrew's Answer that the '144 Patent and each of its claims are invalid and/or unenforceable under one or more sections of Title 35 of the United States Code, including §§ 101, 102, 103, and/or 112," including the identity of each section of Title 35 of the United States Code under which the '144 Patent and each of its claims are allegedly invalid and/or unenforceable, which claims of the '144 Patent are allegedly invalid and/or unenforceable under each section of Title 35 identified, the prior art, if any, that allegedly renders each claim of the '144 Patent invalid and/or unenforceable under each section of Title 35 identified, and how such prior art allegedly renders each claim of the '144 Patent invalid and/or unenforceable under each section of Title 35 identified.

Response:

Subject to and without waiving its General Objections, Andrew responds that the '144 Patent is invalid for at least the following reasons:

Japanese Laid-Open Patent Application Publication No. H3-239091, named inventor Mitsunori Kono (the "Kono reference"), anticipates each claim of the '144 Patent under 35 U.S.C. § 102 and/or renders each claim of the '144 Patent obvious under 35 U.S.C. § 103. The Kono reference was filed February 16, 1990 and published October 24, 1991 -- over a year before the May 7, 1993 filing date of the application for the '144 Patent.

The Kono reference states, "[t]his invention . . . has as its object to make it possible to measure the distance between a base station and a moving body, and also to produce a moving body radio communication apparatus that can locate the position of a moving body." (Kono reference, p. 3). The Kono reference teaches, "[t]he moving body radio communication apparatus of this invention is provided with a plurality of base stations that possess a shared channel reception means that receives position locating signals from a moving body using shared channels that are allotted jointly, a switching station that receives data in the form of these position locating signals, and a position locating means that is connected to the switching station, inputs the above-mentioned data, and locates the position of a moving body." (*Id.*)

The Kono reference also teaches at page 4 (reference numerals omitted):

> The control channel transceivers are modulated by announcing signals that contain identifier signals of the base stations, and the carrier waves of the respectively differing radio frequencies are continuously transmitted. The mobile equipment scans all of the designated control channels, fixes to the one with the largest reception electrical field, and stands by. . . . At this point, if there is a request to locate the position of a specific mobile equipment at the junction point connecting to the public telecommunications network, then the exchange station issues a command to the base stations to call and locate the position of the mobile equipment. When this is received, the control device radiates a call signal in the space from the antenna via the control channel transceivers and the antenna-sharing devices to call the mobile equipment. The mobile equipment stands by to receive the signal with strongest electrical field from among the radiated position locating call signals radiated by the base station, using the control channel, and when this position locating call signal is received, it [the mobile station] immediately transmits a response signal, switching to a shared channel and emitting a position locating signal which is a burst digital station.

In addition, the Kono reference teaches that (reference numerals omitted): "[f]urthermore, when some of the shared channel receivers of the base stations receive the position locating signal from the mobile equipment, the absolute time or the relative time when the position locating signal arrives is determined by correlation detecting the unique word contained therein, and reports to the switching station via the control devices data such as the difference in arrival time of position locating signals with respect to the various base stations. The base station forwards these data to the position location calculating device, and the position of the mobile equipment is calculated." (*Id.*)

The Kono reference also teaches (reference numerals omitted): "position location stations [that] are provided to increase the accuracy of locating the position of the mobile equipment, and when the mobile equipment transmits a position locating signal using a shared channel, the arrival time is measured, and the data is reported to the switching station. The switching station transmits the data from the base stations and the data from the position locating

stations to the position locating calculating device, causing the position of the mobile equipment to be calculated." (*Id.*)

Andrew also refers TruePosition to the claim charts below, which further demonstrate that the Kono reference invalidates each claim of the '144 Patent, particularly if TruePosition tries to read the '144 Patent claims on Andrew's geolocation products.

Claim Language	**Kono Invalidates the Asserted Claim**
1. A cellular telephone location system for determining the locations of multiple mobile cellular telephones	All of figure 1 and the accompanying description. *See also* page 2, ¶ 2-Page 3, ¶ 1 ("FIG. 4 shows…control device 3c terminate operation.").
each initiating periodic signal transmission over one of a prescribed set of reverse control channels, comprising:	*"12a – 12n* are control channel transceivers that transmit and receive signals for the control channels allotted for each of the base stations *3a – 3n."* Page 2, ¶ 2, ll. 5-6. The mobile cellular telephones taught by Kono each initiate periodic signal transmissions.
(a) at least three cell site systems, each cell site system comprising:	Base stations 3a-3n.
an elevated ground-based antenna;	Antennas 4a-4n.
a baseband convertor operatively coupled to said antenna for receiving cellular telephone signals transmitted over a reverse control channel by said cellular telephones and providing baseband signals derived from the cellular telephone signals;	Control channel transceivers 12a-12n.
a timing signal receiver for receiving a timing signal common to all cell sites;	"…the time of the standard clock *54* is corrected by the switching station *1*." Page 5, ¶ 3, l. 16.
and a sampling subsystem operatively coupled to said timing signal receiver and said baseband convertor for sampling said baseband signal at a prescribed sampling frequency and formatting the sample signal into frames of	Kono teaches software and processors in hardware unit 55 that determine and format time of arrival information. Time stamp bits representing the time at which

Claim Language	Kono Invalidates the Asserted Claim
digital data, each frame comprising a prescribed number of data bits and time stamp bits, said time stamp bits representing the time at which said cellular telephone signals were received; and	the cellular telephone signals are received: "The standard clock *54* is an ultra-high precision clock, and the time measurement circuit *53* measures the absolute time of the above-mentioned trigger, and reports it to the switching station *1* from the control circuit *55* via the control device *11*." Page 5, ¶ 3. ll. 13-15.
(b) a central site system operatively coupled to said cell site systems, comprising:	Kono teaches a central site system operatively coupled to the cell site systems.
means for processing said frames of data from said cell site systems	"where reference numeral *2* is a position location calculating device" Page 4, ¶ 1, l. 1.
to generate a table identifying individual cellular telephone signals and the differences in times of arrival of said cellular telephone signals among said cell site systems;	Kono teaches software and processors in hardware unit 54 that determine and format time of arrival information. "reports to the switching station *1* via the control devices *11a – 11n* data such as the difference in arrival time of position locating signals with respect to the various base stations *3a – 3n*." Page 4, ¶ 2, ll. 21-23.
and means for determining, on the basis of said times of arrival differences, the locations of the cellular telephones responsible for said cellular telephone signals.	"The base station *1* forwards these data to the position location calculating device *2*, and the position of the mobile equipment *5* is calculated." Page 4, ¶ 2, ll. 23-25.

Claim Language	Kono Invalidates the Asserted Claim
2. A cellular telephone location system as recited in claim 1,	See the above claim chart for claim 1.
wherein said timing signal receiver comprises a global positioning system (GPS) receiver.	Kono teaches software and processors in hardware unit 54 that determine and format time of arrival information. "reports to the switching station *1* via the control devices *11a – 11n* data such as the difference in arrival time of position locating signals with respect to the various base stations

Claim Language	Kono Invalidates the Asserted Claim
	3a – 3n." Page 4, ¶ 2, ll. 21-23.

Claim Language	Kono Invalidates the Asserted Claim
22. A ground-based cellular telephone system serving a plurality of subscribers possessing mobile cellular telephones, comprising:	All of figure 1 and the accompanying description. *See also* page 2, ¶ 2-Page 3, ¶ 1 ("FIG. 4 shows…control device 3c terminate operation.").
(a) at least three cell sites ;	Base stations 3a-3n.
equipped to receive signals sent by multiple mobile cellular telephones	Control channel transceivers 12a-12n.
each initiating periodic signal transmissions	The mobile cellular telephones taught by Kono each initiate periodic signal transmissions.
over one of a prescribed set of reverse control channels	"*12a – 12n* are control channel transceivers that transmit and receive signals for the control channels allotted for each of the base stations *3a – 3n*." Page 2, ¶ 2, ll. 5-6.
(b) locating means for automatically determining the locations of said cellular telephones by receiving and processing signals emitted during said periodic reverse control channel transmissions; and	Kono teaches software and processors in hardware unit 55 that determine and format time of arrival information. "The standard clock *54* is an ultra-high precision clock, and the time measurement circuit *53* measures the absolute time of the above-mentioned trigger, and reports it to the switching station *1* from the control circuit *55* via the control device *11*." Page 5, ¶ 3. ll. 13-15. "reference numeral *2* is a position location calculating device" Page 4, ¶ 1, l. 1. "The base station *1* forwards these data to the position location calculating device *2*, and the position of the mobile equipment *5* is calculated." Page 4, ¶ 2, ll. 23-25.

Claim Language	Kono Invalidates the Asserted Claim
(c) database means for storing location data identifying the cellular telephones and their respective locations, and for providing access to said database to subscribers at remote locations.	"reports to the switching station *1* via the control devices ***11a – 11n*** data such as the difference in arrival time of position locating signals with respect to the various base stations ***3a – 3n***." Page 4, ¶ 2, ll. 21-23.

Claim Language	Kono Invalidates the Asserted Claim
31. A method for determining the location(s) of one or more cellular telephones each	All of figure 1 and the accompanying description. *See also* page 2, ¶ 2-Page 3, ¶ 1 ("FIG. 4 shows...control device 3c terminate operation.").
initiating periodic signal transmissions over one of a prescribed set of reverse control channels, comprising the steps of:	"***12a – 12n*** are control channel transceivers that transmit and receive signals for the control channels allotted for each of the base stations ***3a – 3n***." Page 2, ¶ 2, ll. 5-6. The mobile cellular telephones taught by Kono each initiate periodic signal transmissions.
(a) receiving said reverse control channel signals at least three geographically separated cell sites;	"***12a – 12n*** are control channel transceivers that transmit and receive signals for the control channels allotted for each of the base stations ***3a – 3n***." Page 2, ¶ 2, ll. 5-6.
(b) processing said signals at each cell site to produce frames of data,	Kono teaches software and processors in hardware unit 55 that determine and format time of arrival information. "where reference numeral *2* is a position location calculating device" Page 4, ¶ 1, l. 1.
each frame comprising a prescribed number of data bits and time stamp bits,	Kono teaches software and processors in hardware unit 55 that determine and format time of arrival information. "The standard clock *54* is an ultra-high precision clock, and the time measurement circuit *53* measures the absolute time of the above-mentioned trigger, and reports it to the switching station *1* from the control circuit *55* via the control device *11*. " Page 5, ¶ 3. ll. 13-15.
said time stamp bits representing the time at which said frames were produced at each cell site;	"The standard clock *54* is an ultra-high precision clock, and the time measurement circuit *53* measures the absolute time of the above-mentioned trigger, and reports it to the

Claim Language	Kono Invalidates the Asserted Claim
	switching station *1* from the control circuit *55* via the control device *11*. " Page 5, ¶ 3. ll. 13-15.
(c) processing said frames of data to identify individual cellular telephone signals and the differences in times of arrival of said cellular telephone signals among said cell sites; and	Kono teaches software and processors in hardware unit 54 that determine and format time of arrival information. "reports to the switching station *1* via the control devices ***11a* – *11n*** data such as the difference in arrival time of position locating signals with respect to the various base stations *3a – 3n*." Page 4, ¶ 2, ll. 21-23.
determining, on the basis of said times of arrival differences, the locations of the cellular telephones responsible for said cellular telephone signals.	"The base station *1* forwards these data to the position location calculating device ***2***, and the position of the mobile equipment *5* is calculated." Page 4, ¶ 2, ll. 23-25.

Claim Language	Kono Invalidates the Asserted Claim
32. A method as recited in claim 31,	See the above claim chart for claim 31.
further comprising the steps of storing, in a database, location data identifying the cellular telephones and their respective locations, and providing access to said database to subscribers at remote locations.	"reports to the switching station *1* via the control devices ***11a* – *11n*** data such as the difference in arrival time of position locating signals with respect to the various base stations *3a – 3n*." Page 4, ¶ 2, ll. 21-23.

* * *

Andrew reserves the right to supplement, modify and/or amend its answer to this interrogatory.

GENERAL OBJECTIONS

1. Andrew incorporates by reference its prior General Objections to the above interrogatories.

Dated: November 8, 2006

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IN THE UNITED STATES DISTRICT COURT
FOR THE DISTRICT OF DELAWARE

TruePosition, Inc.,	)	
	)	
Plaintiff/ Counterclaim-Defendant,	)	
	)	**Civil Action No. 05-747-SLR**
v.	)	
	)	
Andrew Corporation,	)	**CONFIDENTIAL**
	)	
Defendant/ Counterclaim-Plaintiff.	)	
	)	

TRUEPOSITION'S IDENTIFICATION OF CLAIM TERMS AND PROPOSED CONSTRUCTIONS

Pursuant to paragraph 5 of the court's Scheduling Order (D.I. 23), and the parties' October 13, 2006 (D.I. 94), TruePosition sets forth below those claim terms and phrases of the 144 Patent that it believes require construction, as well as TruePosition's proposed constructions of those terms.

144 Patent Claim Term or Phrase	Proposed Construction
"**means** for processing said frames of data from said cell site systems to generate a table identifying individual cellular telephone signals and the differences in times of arrival of said cellular telephone signals among said cell site systems" (Claim 1)	A computer processor programmed to perform the algorithm disclosed at Col. 13, ll. 33-56 (ending with the acronym "TDOA"), Fig. 7 at the First Four Blocks and Table, Col. 17, ll. 26-68 (minus any reference to "frequency difference data" or "frequency difference results") and Figs. 8a-8b (minus any reference to "frequency differences"), or equivalents of such a computer processor. Claim language that is not in bold should be construed according to its ordinary dictionary meaning pursuant to Paragraph 7 of the Court's Scheduling Order (D.I. 23).
"**means** for determining, on the basis of said times of arrival differences, the locations of the	A computer processor programmed to perform the algorithm disclosed at Col. 13, l. 58

144 Patent Claim Term or Phrase	Proposed Construction
cellular telephones responsible for said cellular telephone signals" (Claim 1)	(beginning with the word "This") through Col. 13, l. 62 (ending with the letter "C"), Fig. 7, at the Fifth and Sixth Blocks, Col. 18, ll. 1-34 (ending with "0.0001," but minus any reference to "frequencies") and Fig. 8c through Top Four Elements of Fig. 8d (minus any reference to "frequencies"), or equivalents of such a computer processor. Claim language that is not in bold should be construed according to its ordinary dictionary meaning pursuant to Paragraph 7 of the Court's Scheduling Order (D.I. 23).
"**locating means** for automatically determining the locations of said cellular telephones by receiving and processing signals emitted during said periodic **reverse control channel** transmissions" (Claim 22)	A computer processor programmed to perform the algorithm disclosed at Col. 13, ll. 33-62 (ending with the letter "C"), Figure 7 at the First Six Blocks and Table, Col. 17, l. 26 – Col. 18, l. 34 (ending with "0.0001," but minus any reference to "frequency difference data," "frequency difference results" or "frequencies") and Figs. 8a through the Top Four Elements of Fig. 8d (minus any reference to "frequency differences" or "frequencies"), or equivalents of such a computer processor. Claim language that is not in bold should be construed according to its ordinary dictionary meaning pursuant to Paragraph 7 of the Court's Scheduling Order (D.I. 23).
"**database means** for storing location data identifying the cellular telephones and their respective locations, and for providing access to said database to subscribers at remote locations" (Claim 22)	The combination of the "database 20" and the "first terminal 22 coupled via a modem . . . and telephone line to the database 20" disclosed in Col. 9, ll. 25-27, Fig. 2 Blocks 20, 22, or equivalents such a combination; Or The combination of the "database 20" and the "second terminal 24 in radio communication with the database 20" disclosed in Col. 9, ll. 27-29, Fig. 2, Blocks 20, 24, or equivalents of such a combination; Or

144 Patent Claim Term or Phrase	Proposed Construction
	The combination of the "database 20" and the "third, handheld terminal 26, which is carried by a user who also has a cellular telephone 10b, in radio communication with the database" disclosed in Column 9, ll. 29-31, Fig. 2, Blocks 20, 26, or equivalents of such a combination. Claim language that is not in bold should be construed according to its ordinary dictionary meaning pursuant to Paragraph 7 of the Court's Scheduling Order (D.I. 23).
"reverse control channel(s)" (Claims 1, 22 and 31)	A control channel(s) from a cellular telephone(s) to a cell site(s).

TruePosition contends that any terms and phrases that it has not identified in asserted claims 1, 2, 22, 31, and 32 should be construed according to their ordinary dictionary meaning pursuant to Paragraph 7 of the Court's Scheduling Order (D.I. 23).

In preparing this list of terms and proposed constructions, TruePosition has relied upon the statement of Andrew's contentions in Andrew Corporation's Supplemental Responses to TruePosition's Interrogatory Nos. 3 and 7 served November 8.

Dated: November 22, 2006

By: /s/ Daniel Goettle

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IN THE UNITED STATES DISTRICT COURT
FOR THE DISTRICT OF DELAWARE

TruePosition, Inc.,	)	
	)	
Plaintiff/	)	
Counterclaim-Defendant,	)	
	)	**Civil Action No. 05-747-SLR**
v.	)	
	)	
Andrew Corporation,	)	
	)	
Defendant/	)	
Counterclaim-Plaintiff.	)	
	)	

CERTIFICATE OF SERVICE

I, Daniel Goettle, hereby certify that on this 22nd day of November, 2006, I served the foregoing TruePosition's Identification of Claim Terms and Proposed Constructions on counsel for defendant Andrew Corporation as follows:

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/s/ Daniel Goettle
Daniel Goettle

Preliminary Claim Constructions
as of November 22, 2006

Claim Term	Andrew's Proposed Construction	TruePosition's Proposed Construction
Control channels	An analog channel that is simultaneously shared by multiple cellular telephones and that carries and communicates only signaling information	
Database means for [1] storing location data identifying the cellular telephones and their respective locations, and [2] for providing access to said database to subscribers at remote locations	• Function: storing location data identifying the cellular telephones and their respective locations, and for providing access to the database to subscribers at remote locations • Structure: a database or local disk storage device containing the telephone number corresponding to each cellular telephone and a terminal coupled to the database via (1) modem and telephone line, or (2) radio communication providing access to the database to the user	
Determining Means for determining, on the basis of said times of arrival differences, the locations of the cellular telephones responsible for said cellular telephone signals	• Function: to determine on the basis of time of arrival differences, the locations of the mobile cellular telephones whose signals are received • Structure: a general purpose computer programmed with the algorithm disclosed in the '144 patent using least squares	
Time stamp bits	Time stamp representing the exact time the frame of data was created	

Preliminary Claim Constructions
as of November 22, 2006

Identifying individual cellular telephone signals	Identifying a particular mobile cellular telephone with a number linked only with that mobile cellular telephone and no other mobile cellular telephones, such as the telephone number	
Identifying the cellular telephones		
Initiating	Causing or bringing about	
Locating means for automatically determining the locations of said cellular telephones by receiving and processing signals emitted during said periodic reverse control channel transmissions	• Function: Automatically determine the location of cellular telephones by monitoring every periodic control channel transmission emitted from every mobile cellular telephone to determine the location of all such mobile cellular telephones without a specific request to locate them, and processing the signals emitted from the phones • Structure: a general purpose computer programmed with the algorithm disclosed in the '144 patent using least squares	
Periodic	Occurring at regular intervals	
Periodically		
Prescribed set	Set of 21 frequency bands that are assigned to be control channels in the AMPS system	
Processing	• Function: to generate a table • Structure: The elements recited in figures 6 and 6A, including algorithms disclosed in the patent	
Means for processing said frames of data from said cell site systems to generate a table		

Preliminary Claim Constructions
as of November 22, 2006

Reverse	A signal in the uplink direction, *i.e.* from a mobile cellular telephone to a base station	
Subscribers possessing mobile cellular telephones	Users of the mobile cellular telephones	
Timing signal	Signal that is provided to all cell sites to generate a time stamp for each frame of data	

IN THE UNITED STATES DISTRICT COURT
FOR THE DISTRICT OF DELAWARE

TruePosition, Inc., **Plaintiff/ Counterclaim-Defendant,** **v.** **Andrew Corporation,** **Defendant/ Counterclaim-Plaintiff.**	)	**Civil Action No. 05-747-SLR**

TRUEPOSITION'S PROPOSED CONSTRUCTION OF CLAIM TERMS AND PHRASES THAT ANDREW BELIEVES REQUIRE CONSTRUCTION

TruePosition sets forth below its proposed construction of certain terms and phrases that Andrew has now claimed that the Court must construe. In the chart below, terms and phrases recited in the 144 Patent claims are in bold.

144 Patent Claim Term or Phrase	**Proposed Construction**
Control Channel(s) (Claims 1, 22 and 31)	Band(s) of frequencies used to transmit control information to and from a cellular telephone(s); not voice channel(s).
Determining (Claims 1, 22, 31)	No explicit construction is required. To the extent that the Court decides otherwise, the term means: Arriving at a decision about.
Time stamp bits (Claims 1, 31)	Binary units of computer information representing a time stamp.
Identifying individual cellular telephone signals (Claim 1)	No explicit construction is required. To the extent that the Court decides otherwise, the phrase means: Identifying particular cellular telephone signals.
Identifying the cellular telephones (Claims 22, 32)	No explicit construction is required. To the extent the Court decides otherwise, the phrase means:

144 Patent Claim Term or Phrase	Proposed Construction
	In Claim 22, Identifying the "**multiple mobile cellular telephones each initiating periodic signal transmissions over one of a prescribed set of reverse control channels**" recited in claim 22. In Claim 32, Identifying the "**cellular telephones responsible for said cellular telephone signals**" recited in claim 31.
Initiating (Claims 1, 22)	No explicit construction is required. To the extent the Court decides otherwise, the term means: Causing or facilitating the beginning of.
Periodic(ally) (Claims 1, 22, 31)	No explicit construction is required. To the extent the Court decides otherwise, the term means: Discontinuous(ly).
Prescribed set (Claims 1, 22, 31)	Andrew has taken this phrase out of context. To the extent the Court chooses to construe this phrase out of context, the phrase means: Set described by a cellular telephone system protocol.
Processing (Claims 1 and 31)	No explicit construction is required. To the extent the Court decides otherwise, the term means: Analyzing with a computer(s).
Reverse (Claims 1, 22, 31)	From a cellular telephone(s) to a cell site(s).
Subscribers possessing mobile cellular telephones (Claim 22)	No explicit construction is required. To the extent the Court decides otherwise, the phrase means: Individuals who agree to receive and pay for a service possessing mobile cellular telephones.
Timing Signal (Claims 1, 2)	No explicit construction is required. To the extent the Court decides otherwise, the phrase means:

144 Patent Claim Term or Phrase	Proposed Construction
	Signal that conveys timing information.

Dated: November 27, 2006

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**IN THE UNITED STATES DISTRICT COURT
FOR THE DISTRICT OF DELAWARE**

TruePosition, Inc., **Plaintiff/ Counterclaim-Defendant,** **v.** **Andrew Corporation,** **Defendant/ Counterclaim-Plaintiff.**	))))))))))))	**Civil Action No. 05-747-SLR**

CERTIFICATE OF SERVICE

I, Daniel J. Goettle, hereby certify that on this 27th day of November, 2006, I served the foregoing TruePosition's Proposed Construction of Claim Terms and Phrases That Andrew Believes Required Construction on counsel for defendant Andrew Corporation as follows:

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IN THE UNITED STATES DISTRICT COURT
FOR THE DISTRICT OF DELAWARE

TruePosition, Inc., **Plaintiff/** **Counterclaim-Defendant,** **v.** **Andrew Corporation,** **Defendant/** **Counterclaim-Plaintiff.**	)	**Civil Action No. 05-747-SLR**

TRUEPOSITION'S CUMULATIVE
IDENTIFICATION OF CLAIM TERMS
AND PROPOSED CONSTRUCTIONS

TruePosition sets forth below its cumulative identification of claim terms and phrases and its proposed construction of those terms and phrases.

144 Patent Claim Term or Phrase	Proposed Construction
"**means** for processing said frames of data from said cell site systems to generate a table identifying individual cellular telephone signals and the differences in times of arrival of said cellular telephone signals among said cell site systems" (claim 1)	A computer processor programmed to perform the algorithm disclosed at Col. 13, ll. 33-56 (ending with the acronym "TDOA"), Fig. 7 at the First Four Blocks and Table, Col. 17, ll. 26-28 (minus any reference to "frequency difference data" or "frequency difference results") and Figs. 8a-8b (minus any reference to "frequency differences"), or equivalents of such a computer processor. Claim language that is not in bold should be construed according to its ordinary dictionary meaning pursuant to Paragraph 7 of the Court's Scheduling Order (D.I. 23).
"**means** for determining, on the basis of said times of arrival differences, the locations of the cellular telephones responsible for said cellular telephone signals" (Claim 1)	A computer processor programmed to perform the algorithm disclosed at Col. 13, l. 58 (beginning with the word "This") through Col. 13, l. 62 (ending with the letter "C"), Fig. 7, at the Fifth and Sixth Blocks, Col. 18, ll. 1-34

144 Patent Claim Term or Phrase	Proposed Construction
	(ending with "0.0001," but minus any reference to "frequencies") and Fig. 8c through Top Four Elements of Fig. 8d (minus any reference to "frequencies"), or equivalents of such a computer processor. Claim language that is not in bold should be construed according to its ordinary dictionary meaning pursuant to Paragraph 7 of the Court's Scheduling Order (D.I. 23).
"**locating means** for automatically determining the locations of said cellular telephones by receiving and processing signals emitted during said periodic **reverse control channel** transmissions" (Claim 22)	A computer processor programmed to perform the algorithm disclosed at Col. 13, ll. 33-62 (ending with the letter "C"), Figure 7 at the First Six Blocks and Table, Col. 17, l. 26 – Col. 18, l. 34 (ending with "0.00001," but minus any reference to "frequency difference data," "frequency difference results" or "frequencies") and Figs. 8a through the Top Four Elements of Fig. 8d (minus any reference to "frequency differences" or "frequencies"), or equivalents of such a computer processor. Claim language that is not in bold should be construed according to its ordinary dictionary meaning pursuant to Paragraph 7 of the Court's Scheduling Order (D.I. 23).
"**database means** for storing location data identifying the cellular telephones and their respective locations, and for providing access to said database to subscribers at remote locations" (claim 22)	The combination of the "database 20" and the "first terminal 22 coupled via a modem . . . and telephone line to the database 20" disclosed in Col. 9, ll. 25-27, Fig. 2 Blocks 20, 22, or equivalents of such a combination; Or The combination of the "database 20" and the "second terminal 24 in radio communication with the database 20" disclosed in Col. 9, ll. 27-29, Fig. 2, Blocks 20, 24, or equivalents of such a combination; Or The combination of the "database 20" and the "third, handheld terminal 26, which is carried by a user who also has a cellular telephone

144 Patent Claim Term or Phrase	Proposed Construction
	10b, in radio communication with the database" disclosed in Column 9, ll. 29-31, Fig. 2, Blocks 20, 26, or equivalents of such a combination. Claim language that is not in bold should be construed according to its ordinary dictionary meaning pursuant to Paragraph 7 of the Court's Scheduling Order (D.I. 23)
reverse control channel(s) (Claim 1, 22 and 31)	A **control channel(s)** from a cellular telephone(s) to a cell site(s).
Control Channel(s) (Claims 1, 22 and 31)	**Channel(s)** used to transmit control information to and from a cellular telephone(s); not voice **channel(s)**.
Determining (Claims 1, 22, 31)	No explicit construction is required. To the extent that the Court decides otherwise, the term means: Arriving at a decision about.
Time stamp bits (Claims 1, 31)	Binary units of computer information representing a time stamp.
Identifying individual cellular telephone signals (Claim 1)	No explicit construction is required. To the extent that the Court decides otherwise, the phrase means: Identifying particular cellular telephone signals.
Identifying the cellular telephones (Claims 22, 32)	No explicit construction is required. To the extent the Court decides otherwise, the phrase means: In Claim 22, Identifying the "**multiple mobile cellular telephones each initiating periodic signal transmissions over one of a prescribed set of reverse control channels**" recited in claim 22. In Claim 32, Identifying the "**cellular telephones responsible for said cellular telephone signals**" recited in claim 31.
Initiating (Claims 1, 22)	No explicit construction is required. To the extent the Court decides otherwise, the term

144 Patent Claim Term or Phrase	Proposed Construction
	means: Causing or facilitating the beginning of.
Periodic(ally) (Claims 1, 22, 31)	No explicit construction is required. To the extent the Court decides otherwise, the term means: Discontinuous(ly).
Prescribed set (Claims 1, 22, 31)	Andrew has taken this phrase out of context. To the extent the Court chooses to construe this phrase out of context, the phrase means: Set described by a cellular telephone system protocol.
Processing (Claims 1 and 31)	No explicit construction is required. To the extent the Court decides otherwise, the term means: Analyzing with a computer(s).
Reverse (Claims 1, 22, 31)	From a cellular telephone(s) to a cell site(s).
Subscribers possessing mobile cellular telephones (Claim 22)	No explicit construction is required. To the extent the Court decides otherwise, the phrase means: Individuals who agree to receive and pay for a service possessing mobile cellular telephones.
Timing Signal (Claims 1, 2)	No explicit construction is required. To the extent the Court decides otherwise, the phrase means: Signal that conveys timing information.
Channel(s) (Claims 1, 22, 31)	Information path(s) defined by band(s) of frequencies or digital codes within band(s) of frequencies.

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By: /s/ Daniel J. Goettle

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CERTIFICATE OF SERVICE

I, Daniel J. Goettle, hereby certify that on this 11th day of December, 2006, I served the foregoing TruePosition's Cumulative Identification of Claim Terms and Proposed Constructions on counsel for defendant Andrew Corporation as follows:

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